Mercury Emissions and Available Control Technologies for Combustion Sources

Mercury and Clean Coal Technologies Work Group

Group Members

- Sanat Bhavsar
- Ted Handel
- Chuck McCarty
- Rodney Sobin
- Cindy Huber
- Andrea Stacy
- Gerald Ramsey
- Gerry Pellett
- Tamera Thompson
- Ron Shifflett
- Paige Holt

Acknowledgements

- Rodney Sobin of the Virginia DEQ for assisting in writing this report
- Don Shepherd of the US Park Service who provided much of the basic evaluation information
- Doris McLeod of the Virginia DEQ for assisting in normalizing the units used in the tables
- Monica Harvey of the Virginia DEQ for establishing a coordination web site and patiently adding articles for us

Purpose

- Provide background information about the current initiatives to regulate mercury emissions
- Summarize Clean Coal Technology alternatives for BACT
- Compare the emissions from a state-of-the-art coal-fired power plant with those from a state-of-the-art natural gas power plant

Background Mercury Information

- Neurotoxin which can cause abnormal brain development and mental retardation or learning disabilities
- Implications of national, regional, and global long-range transport are not well understood

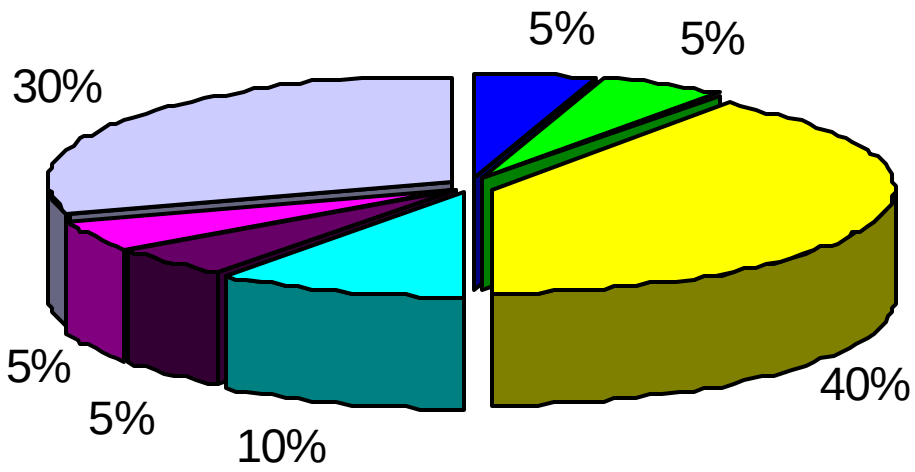
Background Mercury Information

- Consumption Advisories
  - In Virginia
  - Lake Gordonsville, Lake Trashmore, Lake Whitehurst,
  - Segments of the Pamunkey River, the Mattaponi River, Herring Creek, the North Fork of the Holston River, the South River, the Shenandoah River, Blackwater River, Great Dismal Swamp Canal, and Dragon Run Swamp.
- FDA and EPA consumption advisories on marine fish

Background Mercury Information

- Manmade mercury emissions come from a variety of industry sources
- This report is focused on coal fired electrical generating utilities

Anthropogenic Sources of Mercury



- Haz Waste Incinerators
- Chlorine Production
- Coal Fired Electric
- Industrial Boilers
- Municipal Incinerators
- Med Waste Incinerators
- Other

Background Mercury Information

Options for Controlling Mercury Emissions:

- Co-benefit of SO_2 and PM controls
- Presence of carbon in flyash
- SCR – converts elemental mercury to a more easily scrubbed form.
- Alternative combustion technologies

- Control effectiveness is heavily dependent on form of mercury, system design, and fuel burned

Mercury Control Efficiencies
for Bituminous Coal

Controls - PM Only	**% Hg removal**
Cold side electrostatic precipitator (CS-ESP)	46
Hot side electrostatic precipitator (HS-ESP)	12
Fabric filter (FF)	83
PM scrubber	14

Mercury Control Efficiencies

for Bituminous Coal

Flue Gas Desulfurization (FGD)	**% Hg removal**
Spray dryer adsorber (SDA) + FF	98
CS-ESP + Wet FGD	81
HS-ESP + Wet FGD	55
FF + Wet FGD	96

Potential Regulations

- Utility Mercury Reduction Rule
- Interstate Air Quality Rule
- Clear Skies Legislation

Part II. Comparison of Coal and Natural Gas Emissions (lb/mmbtu)

Fuel	Combustion Technology	SO2	NOx	PM 10	CO
Coal	Pulverized Coal Supercritical Boiler	0.15	0.08	0.0180	0.11
Coal	Integrated Gasification Combined Cycle (IGCC)	0.17	0.13	0.0130	0.06
Coal/ Coke	Circulating Fluidized Bed Boiler	0.15	0.09	0.0110	0.13
Natural Gas	Natural Gas-Combined Cycle	0.0019	0.0094	0.0119	0.0066

Part II. Comparison of Coal and Natural Gas Emissions (lbs/mmbtu)

Fuel	Combustion Technology	Hg
Coal	Pulverized Coal Supercritical Boiler	2.39E-06
Coal	Integrated Gasification Combined Cycle (IGCC)	1.94E-06
Coal/ Coke	Circulating Fluidized Bed Boiler	1.09E-05
Natural Gas	Natural Gas-Combined Cycle	ND

Part III. Control Strategies

- Summary Table of Available Technologies
  - Typical control efficiency
  - General capital and operating costs
  - Constraints on use
  - Byproducts produced
  - Status of technology
  - Technology transferability

Part III. Control Strategies

- Technologies Covered Include:
  - Coal Cleaning
  - Combustion
  - Post Combustion
  - Multiple Pollutant Controls
  - Additives and Sorbents